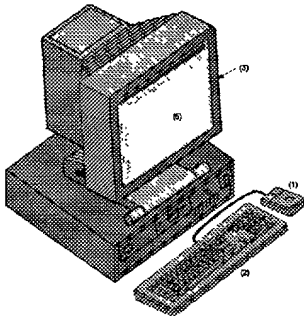
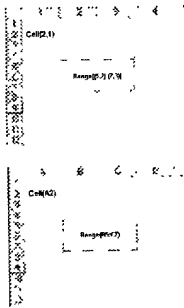


Figure 1.9 A Personal Computer Running an Example Electronic Spreadsheet Window



09681648 "051601
TOTALS 0848480

Figure 2.6 Typical Electronic Spreadsheet Windows without Data



09684643-094604

Figure 3.9 A Data Spreadsheet with Key-ID in the Original Data File

	Key-ID	Year	Value	Year	Value
	1	1990	100	1991	100
	2	1990	100	1991	100
	3	1990	100	1991	100
	4	1990	100	1991	100
	5	1990	100	1991	100
	6	1990	100	1991	100
	7	1990	100	1991	100
	8	1990	100	1991	100
	9	1990	100	1991	100
	10	1990	100	1991	100
	11	1990	100	1991	100
	12	1990	100	1991	100
	13	1990	100	1991	100
	14	1990	100	1991	100
	15	1990	100	1991	100
	16	1990	100	1991	100
	17	1990	100	1991	100
	18	1990	100	1991	100
	19	1990	100	1991	100
	20	1990	100	1991	100

Key-ID is the key used to identify the data in the original data file. The data is organized by Key-ID and Year.

0963463-06460

Figure 2.1: A Data Set with a Missing Key ID

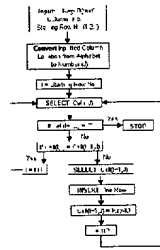
Key ID	Value	Count	Frequency
1	197	197	1
2	198	198	1
3	199	199	1
4	200	200	1
5	201	201	1
6	202	202	1
7	203	203	1
8	204	204	1
9	205	205	1
10	206	206	1
11	207	207	1
12	208	208	1
13	209	209	1
14	210	210	1
15	211	211	1
16	212	212	1
17	213	213	1
18	214	214	1
19	215	215	1
20	216	216	1
21	217	217	1
22	218	218	1
23	219	219	1
24	220	220	1
25	221	221	1
26	222	222	1
27	223	223	1
28	224	224	1
29	225	225	1
30	226	226	1
31	227	227	1
32	228	228	1
33	229	229	1
34	230	230	1
35	231	231	1
36	232	232	1
37	233	233	1
38	234	234	1
39	235	235	1
40	236	236	1
41	237	237	1
42	238	238	1
43	239	239	1
44	240	240	1
45	241	241	1
46	242	242	1
47	243	243	1
48	244	244	1
49	245	245	1
50	246	246	1
51	247	247	1
52	248	248	1
53	249	249	1
54	250	250	1
55	251	251	1
56	252	252	1
57	253	253	1
58	254	254	1
59	255	255	1
60	256	256	1
61	257	257	1
62	258	258	1
63	259	259	1
64	260	260	1
65	261	261	1
66	262	262	1
67	263	263	1
68	264	264	1
69	265	265	1
70	266	266	1
71	267	267	1
72	268	268	1
73	269	269	1
74	270	270	1
75	271	271	1
76	272	272	1
77	273	273	1
78	274	274	1
79	275	275	1
80	276	276	1
81	277	277	1
82	278	278	1
83	279	279	1
84	280	280	1
85	281	281	1
86	282	282	1
87	283	283	1
88	284	284	1
89	285	285	1
90	286	286	1
91	287	287	1
92	288	288	1
93	289	289	1
94	290	290	1
95	291	291	1
96	292	292	1
97	293	293	1
98	294	294	1
99	295	295	1
100	296	296	1
101	297	297	1
102	298	298	1
103	299	299	1
104	300	300	1
105	301	301	1
106	302	302	1
107	303	303	1
108	304	304	1
109	305	305	1
110	306	306	1
111	307	307	1
112	308	308	1
113	309	309	1
114	310	310	1
115	311	311	1
116	312	312	1
117	313	313	1
118	314	314	1
119	315	315	1
120	316	316	1
121	317	317	1
122	318	318	1
123	319	319	1
124	320	320	1
125	321	321	1
126	322	322	1
127	323	323	1
128	324	324	1
129	325	325	1
130	326	326	1
131	327	327	1
132	328	328	1
133	329	329	1
134	330	330	1
135	331	331	1
136	332	332	1
137	333	333	1
138	334	334	1
139	335	335	1
140	336	336	1
141	337	337	1
142	338	338	1
143	339	339	1
144	340	340	1
145	341	341	1
146	342	342	1
147	343	343	1
148	344	344	1
149	345	345	1
150	346	346	1
151	347	347	1
152	348	348	1
153	349	349	1
154	350	350	1
155	351	351	1
156	352	352	1
157	353	353	1
158	354	354	1
159	355	355	1
160	356	356	1
161	357	357	1
162	358	358	1
163	359	359	1
164	360	360	1
165	361	361	1
166	362	362	1
167	363	363	1
168	364	364	1
169	365	365	1
170	366	366	1
171	367	367	1
172	368	368	1
173	369	369	1
174	370	370	1
175	371	371	1
176	372	372	1
177	373	373	1
178	374	374	1
179	375	375	1
180	376	376	1
181	377	377	1
182	378	378	1
183	379	379	1
184	380	380	1
185	381	381	1
186	382	382	1
187	383	383	1
188	384	384	1
189	385	385	1
190	386	386	1
191	387	387	1
192	388	388	1
193	389	389	1
194	390	390	1
195	391	391	1
196	392	392	1
197	393	393	1
198	394	394	1
199	395	395	1
200	396	396	1
201	397	397	1
202	398	398	1
203	399	399	1
204	400	400	1
205	401	401	1
206	402	402	1
207	403	403	1
208	404	404	1
209	405	405	1
210	406	406	1
211	407	407	1
212	408	408	1
213	409	409	1
214	410	410	1
215	411	411	1
216	412	412	1
217	413	413	1
218	414	414	1
219	415	415	1
220	416	416	1
221	417	417	1
222	418	418	1
223	419	419	1
224	420	420	1
225	421	421	1
226	422	422	1
227	423	423	1
228	424	424	1
229	425	425	1
230	426	426	1
231	427	427	1
232	428	428	1
233	429	429	1
234	430	430	1
235	431	431	1
236	432	432	1
237	433	433	1
238	434	434	1
239	435	435	1
240	436	436	1
241	437	437	1
242	438	438	1
243	439	439	1
244	440	440	1
245	441	441	1
246	442	442	1
247	443	443	1
248	444	444	1
249	445	445	1
250	446	446	1
251	447	447	1
252	448	448	1
253	449	449	1
254	450	450	1
255	451	451	1
256	452	452	1
257	453	453	1
258	454	454	1
259	455	455	1
260	456	456	1
261	457	457	1
262	458	458	1
263	459	459	1
264	460	460	1
265	461	461	1
266	462	462	1
267	463	463	1
268	464	464	1
269	465	465	1
270	466	466	1
271	467	467	1
272	468	468	1
273	469	469	1
274	470	470	1
275	471	471	1
276	472	472	1
277	473	473	1
278	474	474	1
279	475	475	1
280	476	476	1
281	477	477	1
282	478	478	1
283	479	479	1
284	480	480	1
285	481	481	1
286	482	482	1
287	483	483	1
288	484	484	1
289	485	485	1
290	486	486	1
291	487	487	1
292	488	488	1
293	489	489	1
294	490	490	1
295	491	491	1
296	492	492	1
297	493	493	1
298	494	494	1
299	495	495	1
300	496	496	1
301	497	497	1
302	498	498	1
303	499	499	1
304	500	500	1
305	501	501	1
306	502	502	1
307	503	503	1
308	504	504	1
309	505	505	1
310	506	506	1
311	507	507	1
312	508	508	1
313	509	509	1
314	510	510	1
315	511	511	1
316	512	512	1
317	513	513	1
318	514	514	1
319	515	515	1
320	516	516	1
321	517	517	1
322	518	518	1
323	519	519	1
324	520	520	1
325	521	521	1
326	522	522	1
327	523	523	1
328	524	524	1
329	525	525	1
330	526	526	1
331	527	527	1
332	528	528	1
333	529	529	1
334	530	530	1
335	531	531	1
336	532	532	1
337	533	533	1
338	534	534	1
339	535	535	1
340	536	536	1
341	537	537	1
342	538	538	1
343	539	539	1
344	540	540	1

Figure 3.2 A Data Spreadsheet Using an Inverted Key-ID to Form Separate Data Sets

	A	B	C	D	E
1	The year	Year	Category	Value	
2	1990	1990	1990	0	
3	1991	1991	1991	100	
4	1992	1992	1992	200	
5	1993	1993	1993	300	
6	1994	1994	1994	400	
7	1995	1995	1995	500	
8	1996	1996	1996	600	
9	1997	1997	1997	700	
10	1998	1998	1998	800	
11	1999	1999	1999	900	
12	2000	2000	2000	1000	
13	2001	2001	2001	1100	
14	2002	2002	2002	1200	
15	2003	2003	2003	1300	
16	2004	2004	2004	1400	
17	2005	2005	2005	1500	
18	2006	2006	2006	1600	
19	2007	2007	2007	1700	
20	2008	2008	2008	1800	
21	2009	2009	2009	1900	
22	2010	2010	2010	2000	
23	2011	2011	2011	2100	
24	2012	2012	2012	2200	
25	2013	2013	2013	2300	
26	2014	2014	2014	2400	
27	2015	2015	2015	2500	
28	2016	2016	2016	2600	
29	2017	2017	2017	2700	
30	2018	2018	2018	2800	
31	2019	2019	2019	2900	
32	2020	2020	2020	3000	
33	2021	2021	2021	3100	
34	2022	2022	2022	3200	
35	2023	2023	2023	3300	
36	2024	2024	2024	3400	
37	2025	2025	2025	3500	
38	2026	2026	2026	3600	
39	2027	2027	2027	3700	
40	2028	2028	2028	3800	
41	2029	2029	2029	3900	
42	2030	2030	2030	4000	
43	2031	2031	2031	4100	
44	2032	2032	2032	4200	
45	2033	2033	2033	4300	
46	2034	2034	2034	4400	
47	2035	2035	2035	4500	
48	2036	2036	2036	4600	
49	2037	2037	2037	4700	
50	2038	2038	2038	4800	
51	2039	2039	2039	4900	
52	2040	2040	2040	5000	
53	2041	2041	2041	5100	
54	2042	2042	2042	5200	
55	2043	2043	2043	5300	
56	2044	2044	2044	5400	
57	2045	2045	2045	5500	
58	2046	2046	2046	5600	
59	2047	2047	2047	5700	
60	2048	2048	2048	5800	
61	2049	2049	2049	5900	
62	2050	2050	2050	6000	
63	2051	2051	2051	6100	
64	2052	2052	2052	6200	
65	2053	2053	2053	6300	
66	2054	2054	2054	6400	
67	2055	2055	2055	6500	
68	2056	2056	2056	6600	
69	2057	2057	2057	6700	
70	2058	2058	2058	6800	
71	2059	2059	2059	6900	
72	2060	2060	2060	7000	
73	2061	2061	2061	7100	
74	2062	2062	2062	7200	
75	2063	2063	2063	7300	
76	2064	2064	2064	7400	
77	2065	2065	2065	7500	
78	2066	2066	2066	7600	
79	2067	2067	2067	7700	
80	2068	2068	2068	7800	
81	2069	2069	2069	7900	
82	2070	2070	2070	8000	
83	2071	2071	2071	8100	
84	2072	2072	2072	8200	
85	2073	2073	2073	8300	
86	2074	2074	2074	8400	
87	2075	2075	2075	8500	
88	2076	2076	2076	8600	
89	2077	2077	2077	8700	
90	2078	2078	2078	8800	
91	2079	2079	2079	8900	
92	2080	2080	2080	9000	
93	2081	2081	2081	9100	
94	2082	2082	2082	9200	
95	2083	2083	2083	9300	
96	2084	2084	2084	9400	
97	2085	2085	2085	9500	
98	2086	2086	2086	9600	
99	2087	2087	2087	9700	
100	2088	2088	2088	9800	
101	2089	2089	2089	9900	
102	2090	2090	2090	10000	
103	2091	2091	2091	10100	
104	2092	2092	2092	10200	
105	2093	2093	2093	10300	
106	2094	2094	2094	10400	
107	2095	2095	2095	10500	
108	2096	2096	2096	10600	
109	2097	2097	2097	10700	
110	2098	2098	2098	10800	
111	2099	2099	2099	10900	
112	2100	2100	2100	11000	
113	2101	2101	2101	11100	
114	2102	2102	2102	11200	
115	2103	2103	2103	11300	
116	2104	2104	2104	11400	
117	2105	2105	2105	11500	
118	2106	2106	2106	11600	
119	2107	2107	2107	11700	
120	2108	2108	2108	11800	
121	2109	2109	2109	11900	
122	2110	2110	2110	12000	
123	2111	2111	2111	12100	
124	2112	2112	2112	12200	
125	2113	2113	2113	12300	
126	2114	2114	2114	12400	
127	2115	2115	2115	12500	
128	2116	2116	2116	12600	
129	2117	2117	2117	12700	
130	2118	2118	2118	12800	
131	2119	2119	2119	12900	
132	2120	2120	2120	13000	
133	2121	2121	2121	13100	
134	2122	2122	2122	13200	
135	2123	2123	2123	13300	
136	2124	2124	2124	13400	
137	2125	2125	2125	13500	
138	2126	2126	2126	13600	
139	2127	2127	2127	13700	
140	2128	2128	2128	13800	
141	2129	2129	2129	13900	
142	2130	2130	2130	14000	
143	2131	2131	2131	14100	
144	2132	2132	2132	14200	
145	2133	2133	2133	14300	
146	2134	2134	2134	14400	
147	2135	2135	2135	14500	
148	2136	2136	2136	14600	
149	2137	2137	2137	14700	
150	2138	2138	2138	14800	
151	2139	2139	2139	14900	
152	2140	2140	2140	15000	
153	2141	2141	2141	15100	
154	2142	2142	2142	15200	
155	2143	2143	2143	15300	
156	2144	2144	2144	15400	
157	2145	2145	2145	15500	
158	2146	2146	2146	15600	
159	2147	2147	2147	15700	
160	2148	2148	2148	15800	
161	2149	2149	2149	15900	
162	2150	2150	2150	16000	
163	2151	2151	2151	16100	
164	2152	2152	2152	16200	
165	2153	2153	2153	16300	
166	2154	2154	2154	16400	
167	2155	2155	2155	16500	
168	2156	2156	2156	16600	
169	2157	2157	2157	16700	
170	2158	2158	2158	16800	
171	2159	2159	2159	16900	
172	2160	2160	2160	17000	
173	2161	2161	2161	17100	
174	2162	2162	2162	17200	
175	2163	2163	2163	17300	
176	2164	2164	2164	17400	
177	2165	2165	2165	17500	
178	2166	2166	2166	17600	
179	2167	2167	2167	17700	
180	2168	2168	2168	17800	
181	2169	2169	2169	17900	
182	2170	2170	2170	18000	
183	2171	2171	2171	18100	
184	2172	2172	2172	18200	
185	2173	2173	2173	18300	
186	2174	2174	2174	18400	
187	2175	2175	2175	18500	
188	2176	2176	2176	18600	
189	2177	2177	2177	18700	
190	2178	2178	2178	18800	
191	2179	2179	2179	18900	
192	2180	2180	2180	19000	
193	2181	2181	2181	19100	
194	2182	2182	2182	19200	
195	2183	2183	2183	19300	
196	2184	2184	2184	19400	
197	2185	2185	2185	19500	
198	2186	2186	2186	19600	
199	2187	2187	2187	19700	
200	2188	2188	2188	19800	
201	2189	2189	2189	19900	
202	2190	2190	2190	20000	
203	2191	2191	2191	20100	
204	2192	2192	2192	20200	
205	2193	2193	2193	20300	
206	2194	2194	2194	20400	
207	2195	2195	2195	20500	
208	2196	2196	2196	20600	
209	2197	2197	2197	20700	
210	2198	2198	2198	20800	
211	2199	2199	2199	20900	
212	2200	2200	2200	21000	
213	2201	2201	2201	21100	
214	2202	2202	2202	21200	
215	2203	2203	2203	21300	
216	2204	2204	2204	21400	
217	2205	2205	2205	21500	
218	2206	2206	2206	21600	
219	2207	2207	2207	21700	
220	2208	2208	2208	21800	
221	2209	2209	2209	21900	
222	2210	2210	2210	22000	
223	2211	2211	2211	22100	
224	2212	2212	2212	22200	
225	2213	2213	2213	22300	
226	2214	2214	2214	22400	
227	2215	2215	2215	22500	
228					

Figure 3.3 Flow Chart of Macro Program for Inserting Key-ID

Figure 3.3 Flow Chart of Macro Program for Inserting Key-ID



(B) Conventional Spreadsheet Reference Style.



Full Collection Program		Call Collection Only	
Lowest-cost Call Reference		Lowest-cost Call Reference	
Example	Full Collection Expression	Conventional Call Reference	Call Costed
1	Cost Name 0	$\text{C}(\text{N}2, \text{C}(\text{N}3))$	Name
a	$\text{C}(\text{N}3, \text{N}2)$	$\text{C}(\text{N}2, \text{C}(\text{N}3))$	Name
		$\text{C}(\text{N}3, \text{C}(\text{N}2))$	Name
		$\text{C}(\text{N}2, \text{C}(\text{N}3))$	Name
	$\text{C}(\text{N}3, \text{N}2)$	$\text{P}(\text{N}2, \text{C}(\text{N}3))$	Name
		$\text{C}(\text{N}3, \text{C}(\text{N}2))$	Name
		$\text{C}(\text{N}2, \text{C}(\text{N}3))$	Name
		$\text{C}(\text{N}3, \text{C}(\text{N}2))$	Name

Figure 5.0 Cell Condition Expression Used to Represent or Identify one Cells containing the Key ID

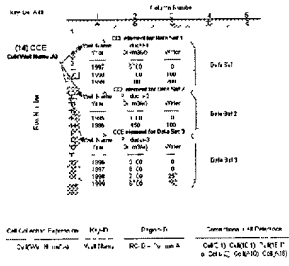
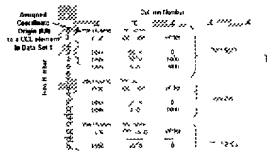


Figure 6.1 Standard Coordinate System Assignment to a CDE element (List Data Set)

Standard Coordinate System assigned to a CDE element with point of origin (0,0) in Data Set 1



09634543 051601

Figure 6-2 Standard Coordinate System Assignment to a CCE element (2nd Data Set)

Standard Coordinate System assigned to a CCE element with nodes at origin (0,0) in Data Set 2

		To Node Item no			
Assigned	Definition	Node	Item	Value	Unit
Only in Data Set 2 a CCE element to Data Set 2	Node 1	1	1	0.0	m
	Node 2	2	2	0.0	m
	Node 3	3	3	0.0	m
	Node 4	4	4	0.0	m
	Node 5	5	5	0.0	m
	Node 6	6	6	0.0	m
	Node 7	7	7	0.0	m
	Node 8	8	8	0.0	m
	Node 9	9	9	0.0	m
	Node 10	10	10	0.0	m
Node 11		11	11	0.0	m
Node 12		12	12	0.0	m
Node 13		13	13	0.0	m
Node 14		14	14	0.0	m
Node 15		15	15	0.0	m
Node 16		16	16	0.0	m
Node 17		17	17	0.0	m
Node 18		18	18	0.0	m
Node 19		19	19	0.0	m
Node 20		20	20	0.0	m
Node 21		21	21	0.0	m
Node 22		22	22	0.0	m
Node 23		23	23	0.0	m
Node 24		24	24	0.0	m
Node 25		25	25	0.0	m
Node 26		26	26	0.0	m
Node 27		27	27	0.0	m
Node 28		28	28	0.0	m
Node 29		29	29	0.0	m
Node 30		30	30	0.0	m
Node 31		31	31	0.0	m
Node 32		32	32	0.0	m
Node 33		33	33	0.0	m
Node 34		34	34	0.0	m
Node 35		35	35	0.0	m
Node 36		36	36	0.0	m
Node 37		37	37	0.0	m
Node 38		38	38	0.0	m
Node 39		39	39	0.0	m
Node 40		40	40	0.0	m
Node 41		41	41	0.0	m
Node 42		42	42	0.0	m
Node 43		43	43	0.0	m
Node 44		44	44	0.0	m
Node 45		45	45	0.0	m
Node 46		46	46	0.0	m
Node 47		47	47	0.0	m
Node 48		48	48	0.0	m
Node 49		49	49	0.0	m
Node 50		50	50	0.0	m
Node 51		51	51	0.0	m
Node 52		52	52	0.0	m
Node 53		53	53	0.0	m
Node 54		54	54	0.0	m
Node 55		55	55	0.0	m
Node 56		56	56	0.0	m
Node 57		57	57	0.0	m
Node 58		58	58	0.0	m
Node 59		59	59	0.0	m
Node 60		60	60	0.0	m
Node 61		61	61	0.0	m
Node 62		62	62	0.0	m
Node 63		63	63	0.0	m
Node 64		64	64	0.0	m
Node 65		65	65	0.0	m
Node 66		66	66	0.0	m
Node 67		67	67	0.0	m
Node 68		68	68	0.0	m
Node 69		69	69	0.0	m
Node 70		70	70	0.0	m
Node 71		71	71	0.0	m
Node 72		72	72	0.0	m
Node 73		73	73	0.0	m
Node 74		74	74	0.0	m
Node 75		75	75	0.0	m
Node 76		76	76	0.0	m
Node 77		77	77	0.0	m
Node 78		78	78	0.0	m
Node 79		79	79	0.0	m
Node 80		80	80	0.0	m
Node 81		81	81	0.0	m
Node 82		82	82	0.0	m
Node 83		83	83	0.0	m
Node 84		84	84	0.0	m
Node 85		85	85	0.0	m
Node 86		86	86	0.0	m
Node 87		87	87	0.0	m
Node 88		88	88	0.0	m
Node 89		89	89	0.0	m
Node 90		90	90	0.0	m
Node 91		91	91	0.0	m
Node 92		92	92	0.0	m
Node 93		93	93	0.0	m
Node 94		94	94	0.0	m
Node 95		95	95	0.0	m
Node 96		96	96	0.0	m
Node 97		97	97	0.0	m
Node 98		98	98	0.0	m
Node 99		99	99	0.0	m
Node 100		100	100	0.0	m

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Figure 6.2: Example: Performing a Copy/Paste Operation on a Spreadsheet

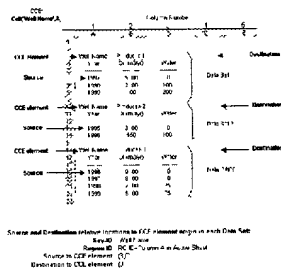


Figure 51 Results of a Copy Paste Operation

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Figure 6.2 Generalized 'Copy Paste' Operation Flow Chart for a Search Region in a User Specified Column

